AD-A176 388 NCEL (NAVAL CIVIL ENGINEERING LABORATORY) QUARTERLY ABSTRACTS OF TECHNICA..(U) NAVAL CIVIL ENGINEERING LAB PORT HUENEME CA 31 DEC 86 1/1

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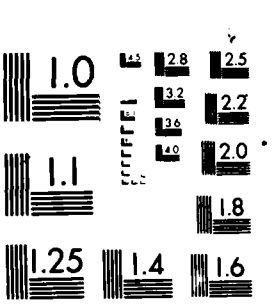

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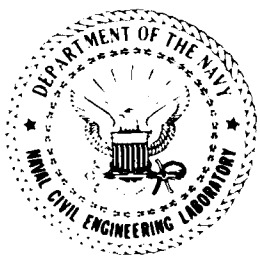

NCEL QUARTERLY ABSTRACTS

of technical documents

1 Jan 1986 to 31 Dec 1986

(recapitulates 3rd quarter)

Naval Civil Engineering Laboratory
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TECHNICAL REPORTS

R-917

Natural Ventilation Cooling of Buildings, Jan 1986, Sophia K. Ashley, ADA165501 (public release)

Natural ventilation can reduce cooling loads and increase human comfort in buildings in hot and humid climates. This report presents design guidelines for: (1) comfort criteria, (2) weather analysis and suitability of site, (3) arrangement of buildings at site, (4) architectural characteristics of building, (5) methods of calculating human comfort and air changes per hour achieved by natural ventilation, (6) a complete set of pressure coefficients for simple buildings with different side ratios, (7) computer simulation of buildings cooled by natural ventilation, (8) a simple method of calculating effective temperatures and comfort bands and, (9) economic analysis of project.

R-918

Historic Earthquake Damage for Buildings and Damage Estimated by the Rapid Seismic Analysis Procedure: A Comparison, Mar 1986, T.K. Lew, ADA166963 (public release)

As part of the Navy's earthquake hazard reduction program, selected structures at various Navy activities were analyzed by the rapid seismic analysis (RSA) procedure to determine their seismic adequacy. Those buildings found to be inadequate were then analyzed in detail to determine the estimated cost. The RSA-estimated damages for steel, concrete, masonry, wood, and brick buildings were compared with historic earthquake damage data. Results indicate reasonably good agreement between the RSA-estimated damage and historic earthquake damage data.

R-919

Evaluation and Validation of the Princeton University Effective Stress Soil Model, Dec 1986, Prof J.H. Prevost, Princeton University, and John M. Ferritto and Robert Slyh, Naval Civil Engineering Laboratory (public release)

An efficient finite element procedure to analyze dynamic transient phenomena in dry and/or fluid-saturated porous media is presented. The saturated porous medium is modeled as a two-phase system consisting of a solid and a fluid phase. Time integration of the resulting semidiscrete finite element equations is performed by an implicit-explicit algorithm. In order to remove the time step size restriction associated with the presence of the stiff fluid in the mixture, the fluid contribution to the equations of motion is always treated implicitly. The procedure allows an optimal selection of the time step size independently of the

fluid. Depending upon the particular intended applications (e.g., seismic, blast loading), the fluid may be assumed incompressible or compressible.

Accuracy and versatility of the proposed procedure are demonstrated by applying it to analyze a number of dynamic soil and/or soil-structure interaction tests and quasi-static consolidation tests performed in centrifuges.

TECHNICAL NOTES

N-1741

The Effects of Steel Profile and Cleanliness on Coating Performance, Jan 1986, Richard W. Drisko, Eddy S. Matsui, and Lee K. Schwab, ADA164788 (public release)

A 5-year study was conducted in cooperation with the Steel Structures Painting Council to determine surface profile and cleanliness requirements for long-term performance of generic coating systems currently used on Navy shore facilities. The experimental design included two levels of cleaning (white metal finish and commercial finish), four levels of profile height (low, medium, high, and very high), eight levels of abrasive (eight different abrasives), and six levels of generic coating system (alkyd, acrylic latex, vinyl, epoxy, coal tar epoxy, and inorganic zinc/vinyl). Replicate sets of the different variations were exposed in a salt fog chamber and at test exposure sites in a tropical marine atmospheric environment at Kwajalein Atoll in the Marshall Islands; in an industrial environment at Pittsburgh, Pa.; and in a relatively mild marine atmospheric environment at Kure Beach, N.C. After 15 months of exposure at Kwajalein, little change had occurred in the overall bonding strengths of the test panels; however, in the next 42 months, a significant overall loss in bonding strength occurred. Significantly different variations occurred between the different coatings systems, and the range of values was greatly reduced. Salt fog exposure had a much greater effect on loss of adhesion than did natural exposure for 57 months for the periods measured. Levels of statistical significance for performance at Kwajalein varied greatly with time and were much greater on scribed than unscribed specimens. Coating system was the most significant variable, followed by abrasive and profile height, and lastly by level of cleaning. Thus, profile was more important than cleanliness in the field performance as well as in the laboratory salt fog testing and the adhesion study.

N-1742

Experimental Polyurethane Foam (PUF) Roofing Systems-III: Naval Station, Roosevelt Roads, Puerto Rico, and Naval Facility, Cape Hatteras, North Carolina, Jan 1986, Spencer R. Conklin, Daniel A. Zarate, and Robert L. Alumbaugh, ADA164833 (public release)

This report presents information on field investigations of experimental polyurethane foam (PUF) roofing systems installed at the Naval Station, Roosevelt Roads, P.R., and the Naval Facility, Cape Hatteras,

N.D. The PUF roof systems were installed on 51 military family housing units at Roosevelt Roads. These roof systems contained a number of experimental variables including three different foams applied at two thicknesses, five protective coating systems applied at thicknesses recommended by their manufacturer, and two different mineral roofing granules applied in the wet topcoat. The majority of the housing units were coated with acrylic and silicone coating systems, but urethane/hypalon, modified urethane, and butyl/hypalon elastomeric coating systems were also used. The topcoat of all coating systems was white, except for the modified urethane, which was aluminum. Eighteen units had electrical meters installed to determine energy savings associated with the foam roof installation. The roofing system installed on the Galley at Cape Hatteras was an acrylic elastomer coated PUF roof applied over a modified bitumen membrane. This report presents results of the experimental PUF roofs after 4-1/2 to 5 years. At Roosevelt Roads, the butyl/hypalon-coated system weathered the best. Energy consumption at Roosevelt Roads decreased at most only 12 to 13% after foaming the roofs. The mineral roofing granules improved weathering characteristics for the acrylic systems but not the silicones. At Cape Hatteras, one-half of the acrylic-coated roof weathered very well, while the other half showed extensive blistering.

N-1743
Guidelines and Field Survey of Navy-Generated Waste Oils Used as Boiler Fuel, Jan 1986, T.T. Fu, PhD and Mark C. Miller, ADB099916L (limited release)

This technical note provides information for a variety of users at different levels of management and operation. Part 1 contains background information on waste oil generation and a survey of waste oil disposition. Part 2 provides pertinent information to Public Works Officers and planners. Topics included: source of waste oil, a survey of disposition of waste oil, restrictions on use as fuel, boiler fuels, air quality considerations, and economics. Part 3 provides procedural information to operators using waste oil as boiler fuel. Waste oil handling, pre-burning treatment, burning methods, equipment modifications, and operational requirements are discussed. Part 4 consists of: a comprehensive survey of the potential for utilizing waste oil by Navy/Marine Corps activities and a compilation of the reported experience of waste oil users.

N-1744
Blistering of Asphalt Pavement Overlay on Runway 14-32 at MCAS Beaufort, South Carolina, Jan 1986, M.C. Hironaka and T.J. Holland, ADA165751 (public release)

The objectives of this investigation were to determine the primary cause of the blistering of the 1-1/2-inch AC overlay on Runway 14-32, Marine Corps Air Station, Beaufort, S.C., and to recommend a repair alternative for the pavement. Pavement temperature profiles and blister surface elevation changes were measured in field tests. Samples of the blister gas and of the overlay were evaluated in laboratory tests. The

test results led to the conclusion that the blister behavior is diurnal in nature and is caused by thermodynamic effects on the air and water vapor trapped at the overlay-substrate interface where disbonding is present. Because of the presence of these disbonded areas and the possibility of blisters forming even with an additional overlay, we recommended that the present overlay be removed and replaced in accordance with standard pavement overlay construction practice.

N-1745
Computer Program to Simulate the Thermal Characteristics of Heat Recovery Incinerators, Feb 1986, C.A. Kodres, ADA165672 (public release)

The computer model, HRI, is described. This model simulates the thermal characteristics of energy ("heat") recovery incinerators. The program takes descriptions of the fuel and of the incinerator as inputs then predicts system temperatures, steam generation rate, and energy recovery efficiency. There are options to include primary or secondary waterwalls, a water/firetube boiler, or combinations of these heat exchangers. Both starved and excess air operations are considered.

N-1746
Application Guide for Heat Recovery Incinerators, Feb 1986, R.M. Roberts, ADA168271 (public release)

This document is intended to assist activity commanders in deciding if an HRI system is a cost-effective means for managing solid wastes and reducing the draw on conventional energy sources. Guidelines are provided on how such a system should be configured in order to give the best results for a particular application.

N-1747
Underwater Nondestructive Testing of Concrete: An Evaluation of Techniques, Feb 1986, A.P. Smith, ADA168270 (public release)

Three commercially available instruments for testing concrete above water were successfully modified for underwater use and evaluated in laboratory and field tests. One of the three instruments was a magnetic rebar locator that locates rebar in concrete structures and measures the amount of concrete cover over the rebar. Another instrument was a Schmidt hammer that evaluates the surface hardness of the concrete and obtains a general condition assessment. The third instrument evaluated was ultrasonic test equipment that estimates compressive strength, detects cracks, and provides a general condition rating of the concrete based on sound velocity measurements.

Laboratory and field tests did not reveal any problems with the fundamental operation of each instrument after they were modified. There was a 23% shift in the output data for the Schmidt hammer as a result of the modifications, but this shift can be eliminated by designing it for underwater use. The modifications did not affect the data from the other two instruments, and all of the instruments were easily operated by a diver.

N-1748
Wind Energy Conversion Systems, Evaluation of Reliability, Availability, and Maintainability at Various Locations, Mar 1986, Dharam Pal, ADA168272 (public release)

This report describes the results of long-term field evaluation of four horizontal-axis, upwind, small wind energy conversion systems (SWECS) configured in an application mode. The long-term field evaluation of these SWECS covers performance, reliability, maintenance, maintainability, and availability data. The results of these evaluations have proven SWECS to be a viable source of alternative energy, but they must be properly designed and maintained to operate in a highly corrosive marine environment. In addition, the SWECS require frequent preventative maintenance, depending on design and location, including corrosion control at least every 3 months. The following recommendations resulted from the field evaluations: (1) do not use sliprings and bearings, if at all possible; (2) use sealed and self-lubricating bearings; (3) ensure that the tower is guyed and hinged for easy maintenance; (4) enclose as much as possible all components exposed directly to the marine environment, or select materials capable of withstanding the marine environment; (5) ensure that all controls are passive and fail safe, if possible; and (6) improve the programming of the synchronous inverter so that it matches generator impedance at all wind speeds.

N-1749
Current-Induced Vessel Forces and Yaw Moments from Full-Scale Measurements, Mar 1986, Paul A. Palo, ADA168273 (public release)

Full-scale measurements of the current-induced forces and yaw moments on a T-2 tanker and Spruance class destroyer are presented. The T-2 data set is made up of 23 tests, including water depth-to-draft ratios between 2.5 and 6, incident current angles between 0 and 95 degrees, current speeds up to 4 ft/sec, and horizontal and vertical current shears. Results are presented from 14 tests of head-on and beam-on loads on a Spruance class destroyer. The deep water lateral force coefficient is shown to be independent of hull shape but with a magnitude that varies ±50% depending on the vertical current shear. Analysis of the deep water longitudinal force, the shallow water lateral force, and the yaw moments shows that these coefficients do not follow "accepted" patterns. These data provide a unique and reliable data set for validating current load methodologies and for validating similitude relationships for small-scale mooring and maneuvering studies.

N-1750
Evaluation of Installed Solar Systems at Navy, Army and Air Force Bases, May 1986, Edward R. Durlak, ADA168887 (public release)

This report presents a summary of the results of site evaluation inspections conducted at Navy, Army, and Air Force bases. The solar systems evaluated included space heating, space cooling, and domestic hot water systems. The systems range in size from small two-collector

systems to large arrays installed on barracks, mess halls, office buildings, etc. These operational results are presented so that future designs will benefit from the "lessons learned" in this study.

N-1751
Environmentally Acceptable Coatings: Latex Coatings for Wood (Plywoods), May 1986, E.S. Matsui and R.W. Drisko, ADA169675 (public release)

Coatings presently used on Navy shore facilities are mostly of the alkyd type, which use organic solvents in their formulation. These solvents present environmental problems because they contribute to the production of photochemical smog. The Naval Civil Engineering Laboratory conducted an investigation into the use of latex coatings on plywood to determine to what extent (1) they could be used as alternatives to alkyd paints without loss of performance and (2) performance could be predicted. It was found that latex coating systems can be satisfactorily substituted for traditional solvent-type alkyd coating systems on wood substrates. By a statistical analysis of penetration data, it should be possible to predict field performance of coatings.

N-1752
Basis of Design for NAVFAC Type I Missile Test Cell, Jun 1986, W. Keenan, J. Tancreto, R. Murtha, R. Kirts, and M. Swisdak, ADB102613 (limited release)

This document is issued to guide the development of construction drawings and specifications for a NAVFAC Type I missile test cell that meets the technical operational requirements of Naval Sea Systems Command (NAVSEA), explosives safety requirements of NAVSEA OP-5, and ordnance criteria of the Naval Facilities Engineering Command (NAVFAC). This document will be used to support MCON Projects 133 (NWS Seal Beach), 267 (NWS Concord), 417 (NWS Yorktown), and 811 (NWS Charleston).

N-1753
Studies of Scour Patterns Produced by Rotating Jets in a Flow Field, Jun 1986, Frank Dellaripa and James A. Bailard, ADA170940 (public release)

A series of laboratory experiments were conducted to determine the scouring properties of submerged jets. Five cases were considered: (1) a jet rotating in still water; (2) a fixed jet in a fluid moving parallel to the jet (coflow); (3) a fixed jet in a fluid moving perpendicular to the jet (crossflow); (4) a fixed jet in a fluid moving against the jet (counterflow); and (5) a jet rotating in a moving fluid. In each case, dimensionless equations were developed to estimate the applied shear stress at the bed as a function of distance from the jet. The test results showed that a fixed coflow jet scoured the greatest distance, and rotating a jet in a mean flow scoured the greatest area. A summary of test results for each jet/current combination is provided in tabular form.

N-1754
Diver Operated Cable Tracking System, Jul 1986, H. Thomson, ADB104567L (limited release)

This report summarizes the development of a cable tracking system for use by Navy divers. The system utilizes a diver held probe to locate and track audio signals impressed on the cable with either a surface operated signal generator or a submersible induction type signal injector. The cable tracking system can locate and track both surface and buried cable, estimate the buried depth of the cable, and locate faulted conductors in the cable. Additional capabilities include tracking on live operating cables and beyond the faulty sections in a cable.

N-1755
Chemical Cleaning of Ship Tanks - Laboratory Investigation of Stripping Agents for Epoxy Coatings, Jul 1986, Peter J. Hearst, PhD, ADA171675 (public release)

Stripping agents for epoxy coatings were investigated for use in a Ship Tank and Bilge Chemical Cleaning Hardware and Processing System (STABCHAPS). This system recycles hot solutions for the removal of contaminants, rust, and coatings. Available commercial stripping agents did not prove to be satisfactory. A very effective stripping agent, NCEL Stripping Agent H4 was developed. It consists of 77% N-methylpyrrolidone, 22% ethanolamine, and 1% Igepal CO630. However, this stripping agent is too hazardous for general use and needs to be modified.

N-1756
Axial Tension Testing of J.A. Johnson Connectors for Use with Intermodal ISO Containers, Jul 1986, Bradley Posadas, ADB105050L (limited release)

The results of a static test to determine whether a J.A. Johnson, Inc. "Box Lox" Container Coupler (connector) meets the tension resistance requirements for use with International Organization for Standarization (ISO) Containers in the Marine Corps Container and Expeditionary Shelter Systems are presented. Eight identical connectors were tested. The maximum applied forces were measured, recorded, and compared with the rated capacity. The coupler met the tension resistance requirements and should be qualified for use in the container and shelter systems.

N-1757
1985 Inspection of Experimental Marine Piling at Pearl Harbor, Hawaii, Aug 1986, D.E. Pendleton and T.B. O'Neill, PhD, ADB104776L (limited release)

In order to determine the effectiveness of both environmentally acceptable and unacceptable wood preservatives in the marine environment, the Naval Civil Engineering Laboratory (NCEL), in cooperation with industry, installed pilings with test preservatives in Pearl Harbor,

Hawaii, in 1963 through 1966 and has observed and evaluated the performances of different treatments. Certain chemicals, such as the chlorinated hydrocarbons chlordane and dieldrin continue to exhibit outstanding preservatives qualities; the use of such preservatives in the marine environment, however, is subject to EPA restrictions. Basic zinc sulfate is an environmentally acceptable preservative that continues to show promise. Cupro-nickel sheathing continues to provide excellent protection. Tributyltin oxide (TBTO) and copper naphthenate, compounds believed to be promising as preservatives, have been ineffective in the present study.

N-1758
Corrosion and Corrosion Control of Hush House Interiors, Sep 1986, J.F. Jenkins, ADA173674 (public release)

The interior of in-frame gas turbine test facilities, commonly referred to as hush houses, is constructed using galvanized steel box sections filled with fibrous acoustic material and covered with perforated galvanized steel plate. The exposed surfaces of the perforated plate have been found to be subject to corrosion at several hush houses. In this report the severity of the corrosion damage on both the perforated liner plate and the interior of the box sections was evaluated, and the corrosion was found to be not structurally serious at this time. Recommendations for removing trapped water from the interior sections, for preventing the ingress of additional water, and for cosmetically repairing existing corrosion damage were formulated and are presented.

N-1759
Blast Design Procedure for Flat Slab Structures, Sep 1986, Robert N. Murtha, ADA174256 (public release)

A general step-by-step procedure was developed for designing flat slab structures to resist dynamic blast loads. The procedure is consistent with the Navy's current blast-resistant design manual NAVFAC P-397 and is based on an equivalent single-degree-of-freedom (SDOF) model of a flat slab. The distribution of reinforcement throughout the slab is based on the elastic distribution of design moments outlined by the American Concrete Institute (ACI). The step-by-step procedure is easily adapted to flat slabs of any configuration and considers both flexural and shear behavior.

N-1760
Handbook for Design of Undersea, Pressure-Resistant Concrete Structures, Oct 1986, H.H. Haynes and R.D. Rail (public release)

This handbook summarizes the development of concrete pressure-resistant structures for ocean applications and presents the results in the form of design guidelines.

The guidelines are based primarily on test results from laboratory and ocean investigations of model concrete structures conducted at NCEL over the past two decades; the guides are principally for designing cylindrical and spherical plain (unreinforced) concrete structures to

resist the externally applied pressures of hydrostatic loads and thus to be safe from implosion failure. Thin-walled and thick-walled structures are considered.

For predicting implosion pressure of thin-walled cylinders, buckling expressions by Donnell for moderately long cylinders and by Bresse for long cylinders are simplified by incorporating experimentally determined numerical values for the modulus of elasticity and Poisson's ratio of high strength concrete and then modified by an empirically determined plasticity reduction factor. For thin-walled spheres, a conservative buckling expression was developed.

The design approach for predicting implosion pressures of thick-walled cylinders and spheres is based on material failure in the wall of the structure; the predicted failure stress in the structure is related to the standard concrete compressive strength, f'_c, by empirically derived strength increase factors.

N-1761

Fluidized Bed Boiler Assessment for Navy Applications, Nov 1986, T.T. Fu, PhD, and G.F. Maga (public release)

This report discusses the assessment of one of the most promising coal-firing technologies--Fluidized-Bed Combustion (FBC)--for Navy stationary boilers. The working principles, physical construction, major and auxiliary components, and system performance of an FBC boiler are described and compared with the conventional stoker and pulverized coal-fired boilers. The advantages of the FBC boiler based on fuel flexibility, operational reliability, economic feasibility, and environmental acceptability are identified, state-of-development and FBC manufacturers are also noted.

The problems with the Great Lakes FBC boiler plant have been studied and possible remedial measures are given. Considerations for FBC retrofitting have been examined based on boiler size, age, configuration, accessory components, and available space. Recommendations on how to achieve the Navy's goal of coal utilization by the FBC approach are outlined.

N-1762

Sampling Criteria and Procedures for Underwater Inspection of Waterfront Facilities, Dec 1986, R.L. Brackett (public release)

Sampling criteria have been developed for planning and executing an underwater inspection of waterfront structures. The proposed sampling criteria use statistical sampling methods and inferences. Statistical sampling provides an objective method for determining the sample size (for variables and for proportions), for estimating population parameters for a desired confidence level and precision, and for evaluating the cost tradeoffs based upon a desired confidence level and precision. The scientific approach to sampling, where an estimate of the condition and the extent of required maintenance is obtained, guarantees that the inspection will gather information that can be analyzed in a manner consistent with standard statistical practices. The procedures presented in this report yield results that can be relied upon for a given

confidence level and accuracy requirement. The criteria presented in this report provide a scientific method for specifying the number of elements to be sampled for each waterfront facility. Data obtained using these criteria can be compared to each other with proven correlation procedures to indicate trends in deterioration rates and allow more accurate projections of maintenance and repair requirements.

CONTRACT REPORTS

CR 86.005
Nonlinear Earthquake Analysis of Concrete Building Structures, Jan 1986, Daniel P. Abrams, PhD, University of Illinois, Urbana-Champaign, IL, N00014-83-D-0689, ADA163517 (public release)

This report presents an initial effort aimed at development of suitable algorithms for nonlinear, dynamic response of reinforced concrete frame buildings. These algorithms employ SDOF systems and are programmed in an interactive mode for use on a microcomputer. Nonlinearity is introduced through generalized hysteresis models that are based on laboratory experiments with sub-scale, multi-story reinforced concrete buildings. Recommendations for further work include verification and sensitivity studies, experimental checking of generalized hysteresis model, and extension to a two DOF model.

CR 86.006
Fracture Mechanics: Applicability to Cracking and Fracture of Concrete, Feb 1986, Professor Stuart E. Swartz, Department of Civil Engineering, Kansas State University, Manhattan, KS, N62583/85-M-T239, ADA165639 (public release)

This report contains a state-of-the-art summary of past and current research activities in the application of fracture mechanics methodologies to cracking and fracture of concrete as well as contains recommendations of a fracture model to determine the fracture process in concrete. Despite known problems, it is recommended that linear elastic fracture mechanics provides a suitable model. A detailed testing procedure and data evaluation are given using a three-point-loaded cracked beam specimen.

CR 86.007
Comparison of Shear Shredder with Hammermill for Size Reduction of Navy Solid Waste, Mar 1986, Bruce E. Bond, Jerry W. Temple, Michael R. Grubbs, Waste Energy Technology Corp, Bedford, MA, N62583/83-M-T465, ADA168202 (public release)

The performances of a rotary shear shredder and a vertical shaft hammermill in reducing domestic and Navy solid wastes were compared over an 8-month-period. The shear shredder processed more and a greater

variety of material at higher rates, with greater availability, lower O&M cost and longer mean time between maintenance actions than the hammermill. The latter, however, had a longer mean time between failures, higher reliability, a reduced average time required to repair, and produced a finer discharge material.

CR 86.008
An Augmented Lagrangian Formulation for the Finite Element Solution of Contact Problems, Mar 1986, Joseph A. Landers and Robert L. Taylor, Department of Civil Engineering, University of California, Berkeley, CA, N62583/85-M-R079, ADA166649 (public release)

A solution method for small deformation frictionless contact problems is developed. First, a review of various solution methods for contact problems is given. Next, a detailed discussion is made of the augmented Lagrangian method. Then, the finite element implementation is discussed. Finally, sample problems and their solutions are presented to demonstrate the usefulness of the method. Both the static and dynamic solution algorithms are described in this report.

CR 86.009
Prestressed Concrete Fender Piles – Analysis and Final Test Pile Details, May 1986, ABAM Engineers, Inc, Federal Way, WA, N62474-84-C3140, ADA169516 (public release)

Using prior test results this study refined an analytical model investigating various alternatives to optimize concrete pile design for Navy piers. Parameters evaluated were: size, prestressing force, load application, ductility, placement of reinforcement, and concrete strength. It was demonstrated that prestressed concrete piles will outperform steel and timber piles in a pile-for-pile energy comparison and are more cost-effective. Recommendations are made for a final test program.

CR 86.010
Operational Test Report: Effects of Moisture and Composition on Densified Refuse-Derived Fuel and System Operating Parameters RDF-3 and RDF-5, Apr 1986, Gary Smith and Helen Belencan, SYSTECH Corp, Xenia, OH, N00123-83-D-0149, ADA168906 (public release)

Using simulated feed stocks, RDF-3 and -5 were produced on the Navy's RDF line at the Naval Air Station, Jacksonville, Fla. Manufacturing conditions, moisture and consituent components were systematically varied, using Simplex Lattice experiment design for the last group of variables. The products resulting were evaluated using a special battery of test procedures to describe eleven different RDF properties. Correlation analysis confirmed expectations concerning manufacturing and the moisture variable; compositional variations produced some interesting although not strong correlations. Regression analytical results were poor.

CR 86.011
Validation of Bounding Surface Plasticity Theory Using Preliminary Geotechnical Centrifuge Experiments, Jul 1986, C.K. Shen, Z.Y. Zhu, L.R. Herrmann, V.N. Kaliakin, Department of Civil Engineering, University of California, Davis, CA, N62583-85-M-T176, ADA171435 (public release)

A 2-D, plane strain, clay-backfilled, retaining wall model study was performed in the centrifuge. Results compared well with SAC-2 finite element predictions of the model behavior using the bounding surface plasticity formulation. This study provides much needed data base for the validation of the bounding surface plasticity theory to model soft soil behavior and its interaction with structures.

CR 86.012
Final Report: RDF Co-Firing Cost/Benefit Analysis Using the NCEL RDF Cost Model - Volume I, Project Results, Volume II, Appendixes, Volume III, RDF Cost Model Manual, Aug 1986, Helen Belencan and Gary Smith, SYSTECH Corporation, Xenia, OH, N00123-83-D-0149, Vol I: ADA173980; Vol II: ADA 173981; Vol III: ADA173982 (public release)

The object of this effort was to determine the cost effectiveness of co-firing RDF in existing Navy boilers. The cost-benefit analysis was performed using the NCEL RDF Cost Model and site specific boiler and cost data acquired from four naval activities that were determined to have the highest probability of successful co-firing. The cost effectiveness was measured by the savings to investment ratio (SIR) and computed over a range of cost and operating conditions to determine the optimum RDF co-firing scenarios for each facility. Based on present laid-down coal costs and solid waste disposal charges, no set of operating conditions could be identified wherein the use of either co-fired RDF-3 or RDF-5 could be economically justified. Volume I presents the report, Volume II contains appendixes, and Volume III is the terminal manual of RDF cost model.

CR 87.001
(not published)

CR 87.002
Investigations and Tests to Determine Hydrodynamic Forces and Moments on Ships Moored in a Current - Vol I, Final Report, Vol II, Phase I Report, Oct 1986, Danish Hydraulic Institute, Horsholm, Denmark, N62474-84-C-3142 (public release)

Experiments with 1:50-scale models produced data on the horizontal force and the yawing moment exerted by a steady current on ships moored in shallow water. Data were obtained for one ship with various headings and for two ships arranged side by side in a beam current. The models were restrained by elastic lines simulating real moorings; for a single ship, rigid supports were also used. The experiments included brief investigations of the minimum flume width, turbulence, flow patterns, and flow-induced motions.

CR 87.003
Crowley Alden A-4 Oil Skimmer Operational Test Report, Oct 1986, Michael Borst, Mason & Hanger-Silas Mason Co., Inc, Leonardo, NJ, 68-03-3203 (public release)

The Environmental Protection Agency (EPA) tested the Crowley Alden A-4 Oil Skimming System at its Oil and Hazardous Simulated Environmental Test Tank (OHMSETT) in Leonardo, NJ. This testing was sponsored by the Naval Civil Engineering Laboratory (NCEL). The tests were required as a part of a Navy purchase to assure that the product met or exceeded specifications in an RFP issued in 1985.

During these tests the skimmer recovered 2 to 3 gallons per minute (gpm) [7.5 to 11.4 liters per minute (lpm)] of oil. There was little or no variation in oil recovery rate introduced by altering test conditions. In calm water, the skimmer recovery efficiency was minimally 85 to 95%. Under wave conditions, the recovery efficiency was 65 to 75%.

The tests program included measurement of the maximum pump rate of an ancillary double diaphragm pump. The greatest pump rate that should be expected is 70 to 80 lpm (18 to 21 gpm). Lower capacities were measured with added head, but the pump performed equally well with DFM as with water. Overall, the skimmer met or exceeded the performance characteristics required for inner harbor use.

CR 87.004
(not published)

CR 87.005
Inspection Frequency Criteria Models for Timber, Steel, and Concrete Pile Supported Waterfront Structures, Dec 1986, Western Instrument Corp, Ventura, CA, N00123-86-D0295-ZZ13 (public release)

The Navy has no specific criteria for establishing the time interval between successive waterfront inspections or for determining the priority of waterfront facilities to be inspected. This report presents the strategy used to develop a preliminary inspection frequency model and the requirements needed to determine the order of inspections. The criteria used for determining when inspections should be performed were: construction material, facility age, present condition, facility environment, and mission requirements. A database was designed for searching, sorting, and correlating inspection data for determining the best time interval between inspections while maintaining safe and operational structures.

CR 87.006
Plastic Media Blasting Data Gathering Study: Final Report, Dec 1986, Engineering Management Concepts, Camarillo, CA, N00123-85-D-0191, (public release)

Plastic Media Blasting (PMB) is proving to be a cost effective method of paint removal with many benefits. Economic savings may reach 50 percent of chemical stripping costs, while hazardous waste volumes can be reduced by up to 90 percent.

This task gathered data in five areas: chemical stripping, equipment and facilities, economics, safety and health, and surface effects. The Chemical Stripping section details cost breakdowns for chemical stripping. The Equipment and Facilities section describes existing facilities; needed blasting and media recovery equipment; different types of media; and media disposal. The Economics section gives two examples of economic analyses conducted for the blast booth at Hill Air Force Base. The Safety section discusses the safety and health risks associated with PMB such as explosion, dust irritation and toxicity, and identifies the appropriate OHSA and ANSI safety standards. Tne Surface Effects section identifies possible damage and crack closure effects, and also identifies materials that have been safely blasted.

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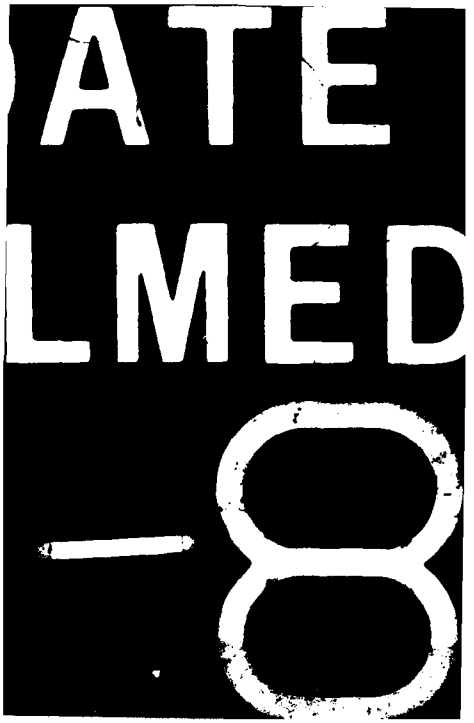
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